

ENGELMANN SPRUCE

Picea engelmannii Parry ex
Engelmann

Plant Symbol = PIEN

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Center & the Biota of North America Program



Botany Dept., NMNH, Smithsonian Institution
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Alternate common names

Silver spruce, white spruce, mountain spruce,
Columbian spruce

Uses

The wood of Engelmann spruce is light-colored, relatively soft, low in resin, and sometimes contains many knots and is more valuable for pulp than for high-grade lumber. It has been used for home construction, pre-fabricated wood products, and plywood manufacture. Less commonly it is used for specialty items such as food containers, and sounding

boards for violins, pianos, and guitars. Engelmann spruce is widely used for Christmas trees. Spruce beer was sometimes made from its needles and twigs and taken to prevent scurvy. The Engelmann spruce—subalpine fir forest association occupies the greatest water-yielding areas in the Rocky Mountains and the natural adaptations of these trees are important in maintaining stable vegetation.

Status

Please consult the PLANTS Web site and your State Department of Natural Resources for this plant's current status, such as, state noxious status and wetland indicator values.

Description

General: Pine Family (Pinaceae). These are native trees growing to 60 meters tall, the crown dense and narrowly conic or spire-like. Branches spreading horizontally to somewhat drooping, the lower often persistent (not strongly self-pruning); twigs not pendent, rather stout, yellow-brown. Bark usually reddish- to purplish-brown and thin scaly. Needles are evergreen, borne singly from all sides of the twig, 1.6-3 (-3.5) cm long, 4-angled, stiff and sharp-pointed, blue-green. Seed cones are violet to deep purple, ripening buff-brown, ellipsoid, pendent, mostly 3-6 cm long, the cone scales relatively small, papery, and flexible, remaining intact after cones fall from the tree. Ssp. *mexicana* differs from the typical ssp. in its lighter (gray) bark, narrower needles (1-1.2 mm wide) and its narrower and slightly larger cones (4.5-8 cm long) and longer cone scales (4-6 mm), although the measurements are overlapping. Named for physician and botanist George Engelmann.

Variation within the species: a primarily Mexican segment of Engelmann spruce is formally distinguished

Picea engelmannii ssp. *engelmannii*

Picea engelmannii ssp. *mexicana* (Martínez) P.
Schmidt

These populations also have been recognized as *P. mexicana* Martínez, *P. engelmannii* var. *mexicana* (Martínez) Taylor & Patterson (illegitimate name), and *P. engelmannii* var. *mexicana* (Martínez) Silba.

Variation in seed dormancy and hardness has been documented over the broad geographic range of the typical subspecies, but no other varieties are generally recognized. In the northern part of its range, Engelmann spruce hybridizes freely and

intergrades with white spruce (*P. glauca*). In the Chilliwack River Valley of British Columbia, it apparently hybridizes with Sitka spruce (*P. sitchensis*).

Distribution

Alberta and British Columbia southward through Nevada, Utah, and Colorado, into Arizona and New Mexico; the southernmost populations in Arizona (Chiricahua Mountains) and New Mexico (Sierra Blanca) are ssp. *mexicana*, which otherwise extends southward into both the eastern and western sierras of northern Mexico. For current distribution, please consult the Plant Profile page for this species on the PLANTS Web site.

Establishment

Adaptation: In montane and subalpine forests, occurring as krummholz at timberline, sometimes growing down into the fir-aspen belt on moist, north facing slopes and in canyons; at 1000-3000 meters elevation. Engelmann spruce and subalpine firs form one of the most common forest associations in the Rocky Mountains.

Planting: Open-grown trees of Engelmann spruce begin cone production at 15-40 years of age but the best seed production is between 150 and 250 years. Good seed crops are generally borne every 2-5 years

Although Engelmann spruce will germinate in all light intensities found in nature, seedlings do not establish readily in the open – 40 to 60 percent of full shade is most favorable for seedling establishment at high elevations. Germination and establishment in undisturbed forest occur on duff, litter, partially decomposed humus, decaying wood, and mounds of mineral soil upturned by wind thrown trees. Because of its slow initial root penetration and extreme sensitivity to heat in the succulent stage, drought and heat girdling kill many first-year spruce seedlings. Drought losses can continue to be significant throughout the Rocky Mountains during the first 5 years of seedling development, especially during prolonged summer dry periods. Once established (at least 5 years old), the ability to survive is favored by adequate soil moisture, cool temperature, and shade. The strong shade tolerance of Engelmann spruce allows it to occur both as a persistent long-lived seral species and as a major climax species.

Engelmann spruce will grow steadily for 300 years, long after the growth of most associated tree species slows down. Dominant spruces are often 250-450 years old and trees 500-600 years old are not

uncommon. Trees reaching 760-850 years are known.

Management

The shallow root system of Engelmann spruce makes it susceptible to windthrow, particularly after cutting opens a stand. Downed wood from windthrow also makes a site vulnerable to attack from the spruce beetle, which has periodically caused severe damage. The western spruce budworm is another potentially damaging insect that attacks both Engelmann spruce and subalpine fir.

Complete removal of a spruce-fir stand by fire or logging results in such drastic environmental changes that spruce and fir are usually replaced by lodgepole pine, aspen, or shrub and grass communities. The kind of vegetation initially occupying the site usually determines the length of time it takes to return to a spruce-fir forest. It may vary from a few years, if the site is initially occupied by lodgepole pine or aspen, to as many as 300 years, if grass is the replacement community.

Cultivars, Improved and Selected Materials (and area of origin)

These plant materials are readily available from commercial sources. Contact your local Natural Resources Conservation Service (formerly Soil Conservation Service) office for more information. Look in the phone book under "United States Government." The Natural Resources Conservation Service will be listed under the subheading "Department of Agriculture."

References

Alexander, R.R. & W.D. Shepperd 1990. *Picea engelmannii*. Pp. 187-203, IN R.M. Burns and B.H. Honkala. *Silvics of North America. Volume 1. Conifers*. USDA Forest Service Agric. Handbook 654, Washington, D.C.
<http://willow.ncfes.umn.edu/silvics_manual/Table_of_contents.htm>

LaRoi, G.H. & J.R. Dugle 1968. *A systematic and genealogical study of Picea glauca and P. engelmannii, using paper chromatography of needle extracts*. Canadian J. Bot. 46:649-687.

Taylor, R.J. 1993. *Picea*. Pp. 369-373, IN: *Flora of North America, north of Mexico*. Vol. 2, *Pteridophytes and gymnosperms*. Oxford Univ. Press, New York. <http://hua.huh.harvard.edu/cgi-bin/Flora/flora.pl?FLORA_ID=12395>

Taylor, R.J. & T.F. Patterson 1980. *Biosystematics of Mexican spruce species and populations*. Taxon 29:421-469.

Taylor, R.J., T.F. Patterson, & R.J. Harrod 1994. *Systematics of Mexican spruce – revisited*. Syst. Bot. 19:47-59.

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